

REMARKS

By the present Amendment, claims 1, 18, and 29 have been amended. Claims 10 and 30 have been cancelled. Accordingly, claims 1-9, 11-29, and 31-34 remain pending in the application. Claims 1, 18, and 29 are independent.

In the Office Action of June 10, 2010, claim 1 was rejected under 35 USC §102(e) as being anticipated by U.S. Patent No. 6,368,277 issued to Mao et al. ("Mao"). This rejection is respectfully traversed.

The Examiner's indication that claim 29 would be allowable, if rewritten in independent form to include all the limitations of the base claim and any intervening claims, is noted with appreciation.

By the present Amendment, Applicants have amended claim 19 to incorporate the subject matter recited in claims 18, 26, and 27. This constitutes presentation of claim 19 in independent form. As indicated in the Office Action, such an amendment would place this claim in condition for allowance.

It is therefore respectfully submitted that independent claim 29 is allowable over the art of record.

Claims 1-28 and 30-34 were rejected under 35 USC §102(e) as being anticipated by Mao. Regarding independent claim 1, for example, the Office Action indicates that Mao discloses an image diagnostic apparatus that comprises imaging means for producing a tomographic image of an object to be examined, a storing unit of storing a moving image formed by a plurality of frames of the tomographic image, and a display unit for displaying the moving image. The Office Action further asserts that Mao discloses an operation unit for designating a desired portion of the tomographic image with a mark, and tracking means for making the mark follow the desired portion of the tomographic image. Applicants respectfully disagree.

By the present Amendment, Applicants have amended independent claim 1 to better define the invention by incorporating features previously recited in claim 10. As amended, independent claim 1 defines an image diagnostic apparatus that comprises:

- imaging means for producing a tomographic image of an object to be examined;

- a storing unit of storing a moving image formed by a plurality of frames of the tomographic image;

- a display unit for displaying the moving image;

- an operation unit for designating at least two portions of the tomographic image with marks; and

- tracking means for making the marks follow the desired portions of the tomographic image based on image information of the desired portions,

- wherein the tracking means:

- stores coordinates of at least two designated portions input from the operation unit after movement,

- calculates at least any one of a distance between the two designated portions, a shift of the distance, a shift speed of the distance, and a change rate of the distance,

- and displays it as a graph on the display unit.

The image diagnostic apparatus of independent claim 1 includes an imaging means for producing a tomographic image of an object to be examined, a storing unit for storing a moving image formed by a plurality of frames of the tomographic image, and a display unit for displaying the moving image. The image diagnostic apparatus also includes an operation unit for designating at least two portions of the tomographic image with marks, and a tracking means which causes the marks to follow the desired portions of the tomographic image based on image information of the desired portions. According to independent claim 1, the tracking means stores coordinates of at least two designated portions that are input from the operation unit

after movement, and calculates either a distance between the two designated portions, a shift of the distance, a shift speed of the distance, a change rate of the distance, or various combinations thereof. The tracking means subsequently displays the results of the calculation as a graph on the display unit.

The Office Action alleges that Mao discloses all of the features of the claimed invention. Applicants' review of this reference, however, suggests otherwise. Mao discloses a system for dynamically measuring parameters within a series of images wherein a sequence of ultrasound images is generated using an ultrasound system and a user determines at least one region of interest within a first image. At least one parameter for each region of interest is evaluated and a new region of interest within a sequential image is searched within an area around a predefined region which best matches the region of interest. This process is repeated for all images within a sequence, and a new region of interest which best matches the region of interest of the previous image is used as the region of interest for the following image.

With respect to claim 10, the Office Action further indicates that Mao's tracking means stores coordinates of at least two designated portions input from the operation unit after movement, calculates at least the distance between the two designated points, and displays it as a line view on the display unit. Contrary to the assertions made in the Office Action, Mao does not disclose a tracking means that calculates the distance between the two designated points and subsequently displays the result. In particular, the assertion that Mao shows the distance that element 201 has moved from 200 and how much element 211 has moved from 210 appears to be misplaced. Fig. 2 of Mao illustrates two ROI's (200, 201) in Image A, and shows how these two ROIs move to a different position in Image B (210, 211).

Mao only discusses the moving distance of each ROI independently from the two images, and not with respect to each other. More particularly, Mao discusses the distance which ROI 200 (in image A) moves to position 201 in Image B. Mao specifically indicates that the two ROIs (200, 210) are defined and examined by an examination routine which, in part, counts every pixel within the ROI whose intensity exceeds the predetermined threshold. See column 3, lines 19-38. For each subsequent image in the sequence, Mao determines if the ROIs have moved. A search area around the ROI of the first image is defined and a best match within the search area of the second image is calculated to establish a new ROI. See column 4, lines 3-13. Thus, it is clear that Mao merely determines the movement of an individual ROI between consecutive images within the sequence. There is no disclosure or suggestion for determining a distance between two different ROIs, i.e., distance between ROI 200 and ROI 201. In contrast, independent claim 1 determines distances between two designated portions, as opposed to a distance between the same portion on subsequent images in the sequence. Consequently, it is not possible for Mao to perform any combination of the calculations performed in independent claim 1, and subsequently display the results. Specifically, Mao fails to provide any disclosure or suggestion for features recited in independent claim 1, such as:

wherein the tracking means:

- stores coordinates of at least two designated portions input from the operation unit after movement,
- calculates at least any one of a distance between the two designated portions, a shift of the distance, a shift speed of the distance, and a change rate of the distance,
- and displays it as a graph on the display unit.

It is therefore respectfully submitted that independent claim 1 is allowable over the art of record.

Claims 2-9, 11-17, and 34 depend from independent claim 1, and are therefore believed allowable for at least the reasons set forth above with respect to independent claim 1. In addition, these claims each introduce novel elements that independently render them patentable over the art of record.

As amended, independent claim 18 defines a tissue movement tracking method that comprises:

- a first step of displaying a one frame image of a moving image formed by producing tomographic images of an object to be examined;

- a second step of setting a designated portion by inputting a command to superpose a mark on the designated portion of a tissue the movement of which is tracked in the displayed one frame image;

- a third step of setting a cutout image of a size including the designated portion in the one frame image;

- a fourth step of searching another frame images of the moving image and extracting a local image of the identical size which is most coincided with the cutout image;

- a fifth step of calculating a coordinate of the designated portion after movement based on a coordinate difference between the most coincided local image and the cutout image;

- storing at least two designated portions are set and coordinates of the two designated portions after movement; and

- calculating at least any one of a distance between the two designated portions, a change of the distance, a change speed of the distance, and a change rate of the distance.

According to the method of independent claim 18, a one frame image of a moving object formed by producing tomographic images of an object to be examined is first displayed, and a designated portion is set by inputting a command to superpose a mark on the designated portion of a tissue whose movement is tracked in the displayed one frame image. A cutout image of a size including the designated

portion is set, and a search of another image frame is performed to extract a local image having an identical size and which most coincides with the cutout image. The coordinate of the designated portion after movement is calculated based on a coordinate difference between the most coincided local image and the cutout image. Similar to independent claim 1, a calculation is made to determine at least any one of a distance between the two designated portions, a change of the distance, a change speed of the distance, and a change rate of the distance. As previously discussed with respect to independent claim 1, Mao fails to provide any disclosure or suggestion for such features and merely discloses a determination of the movement of individual portions from different images in a sequence of images.

It is therefore respectfully submitted that independent claim 18 is allowable over the art of record.

Claims 19-28 and 31-33 depend from independent claim 18, and are therefore believed allowable for at least the reasons set forth above with respect to independent claim 18. In addition, these claims each introduce novel elements that independently render them patentable over the art of record.


For the reasons stated above, it is respectfully submitted that all of the pending claims are now in condition for allowance. Therefore, the issuance of a Notice of Allowance is believed in order, and courteously solicited.

If the Examiner believes that there are any matters which can be resolved by way of either a personal or telephone interview, the Examiner is invited to contact Applicants' undersigned attorney at the number indicated below.

AUTHORIZATION

Applicants request any shortage or excess in fees in connection with the filing of this paper, including extension of time fees, and for which no other form of payment is offered, be charged or credited to Deposit Account No. 01-2135 (Case: 529.44777X00).

Respectfully submitted,
ANTONELLI, TERRY, STOUT & KRAUS, LLP.

/Leonid D. Thenor/ 
Leonid D. Thenor
Registration No. 39,397

LDT/vvr
1300 N. Seventeenth Street
Suite 1800
Arlington, Virginia 22209
Tel: 703-312-6600
Fax: 703-312-6666

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